Math 355 – Numerical Analysis

HW #1

Dr. Joseph Issa

1. (10 Points) Convert the following number to IEEE 754 floating point single precision format

-34.67

Show all your derivation steps for a full credit. The final answer should be in binary (32-bits)

34 TO BINARY

34/2 = 17 r 0

17/2= 8 r 1

8/2= 4 r 0

4/2 =2 r 0

2/2 1 r 0

1/2 = 0 r 1

34 = 100010

.67 TO BINARY

.67 x 2 = 1.34 r1

.34 x 2 = 0.68 r0

.68 x 2 = 1.36 r1

.36 x 2 = 0.72 r0

.72 x 2 = 1.44 r1

.44 x 2 = 0.88 r0

.88 x 2 = 1.76 r1

.76 x 2 = 1.52 r1

.52 x 2 = 1. 04 r1

.04 x 2 = 0.08 r0

.08 x 2 = 0.16 r0

.16 x 2 = 0.32 r0

.32 x 2 = 0.64 r0

.64 x 2 = 1.28 r1

.28 x 2 = 0.56 r0

.56 x 2 = 1.12 r1

.12 x 2 = 0.24 r0

.24 x 2 = 0.48 r0

.48 x 2 = 0.96 r1

.67 = 1010101110000101001

122 To Binary

122/ 2 = 61 R 0

61/2 = 30 R 1

30/2 = 15 R 0

15/2 = 7 R 1

7/2 = 3 R 1

3/2 = 1 R 1

1/2 = 0 R 1

122 = .1111010

I] 34.67 = 100010.1010101110000101001

II] Scientific Notation:

1.000101010101110000101001 x 2^5 =

III] x xxxxxxxx xxxxx…xx

EXP BIAS: 127 - 5 = 122

FINAL ANSWER: 1 1111010 000101010101110000101001

1. (10 points) Covert the following number from base 10 to binary (base 2). Show all your derivation steps for a full credit.

89.102 base (10)

89 to Decimal

89/2 = 44 R 1

44/2 = 22 R 0

22/2 = 11 R 0

11/2 = 5 R 1

5/2 = 2 R 1

2/2 = 1 R 0

½ = 0 R 1

89 = 1011001

.102 To Binary

.102\*2 = 0.204 0

.204\*2 = 0.408 0

.408\*2 = 0.816 0

.816\*2 = 1.632 1

.632\*2 = 1.264 1

.264\*2 = 0.528 0

.528\*2 = 1.056 1

.056\*2 = 0.112 0

.112\*2 = 0.224 0

.224\*2 = 0.448 0

.448\*2 =0.896 0

.896\*2 = 1.792 1

.792\*2 = 1.584 1

.584\*2 = 1.168 1

.168\*2 = 0.336 0  
.336\*2 = 0.672 0

.102 to binary = .0001101000011100

1. (10 points) Find the Taylor series( centered at 0, McLaurin series) for:
2. ( 15 points) Gas Pump Informer

**Write a script that prompts the user for a number of gallons of gasoline. Reprint that value, along with its conversion to other measurements:**

* Equivalent number of liters (format to 4 decimals)
* Number of barrels of oil required to produce it (format to 3 decimals)
* Price in U.S. dollars (format to 2 decimals)

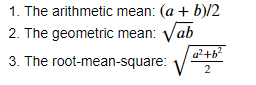
Figures to use:

* 1 gallon is equivalent to 3.7854 liters.
* 1 barrel of oil produces 19.5 gallons of gas.
* The average price of gas is approximately $3.65 per gallon.

Save your script as: gas.py

1. (15 points) Number Averager

**=Write a script that prompts the user for two numbers, a and b. Then, prompt the user to enter a type of average out of the three options below. Make it so the user would just type in a number 1, 2 or 3 for the average (i.e. 1 for arithmetic mean, 2 for geometric mean, or 3 for root-mean-square). This numerical selection is an example of how to give the user a simple response that will get around potential spelling errors and head off user frustration. This design decision makes the user interaction more robust. No requirement to round or format numbers for this problem. Output the correct average, based on what the user selected.**



Save your script as: averages.py